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(71) Applicants
Press-Bat Holdings Limited (United Kingdom),
Halesfield 9, Telford, Shropshire

(72) Inventor
Harold John Andrews

(74) Agent and/or Address for Service
C. P. Healy, 134 Grayswood Avenue, Coventry CV5 8HQ

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(56) Documents cited

GB A	2096664	GB A	2052589	GB A	2044330
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GB	1109430	GB	1101880	GB	0976383
GB	0645853	GB	0382041		

(58) Field of search
E1D E1K

(54) Lateral restraint strap for building construction

(57) The strap (19), of light weight metal strip or high tensile plastics such as polypropylene, for use in providing lateral restraint to a wall of a building (both in the case where joists run parallel to the wall and where they run perpendicular to the wall), has a disc (21) attached as a laminar bearing member to one end and has a 90° twist (25) at a position spaced from the disc (21) by the thickness of the inner leaf (18) of the cavity wall. This portion of the strap can pass either through a space between adjacent blocks or through a coursing joint of the wall. Where joists (13, 14), are parallel to the wall (18), the strap is hammered into the top surfaces and nailed, the free end being hammered down against the side of the further joist (14) and nailed at (27). Where joists are perpendicular to the wall, the strap passes through a coursing joint. The dowturned end can give extra strength to the strap fixings. Damage to lightweight blockwork of the inner leaf (18) is minimised by the large bearing area of the disc (21). It is unnecessary to channel either the block work or the joists to use the strap (19) as was necessary with a prior art strap (10).

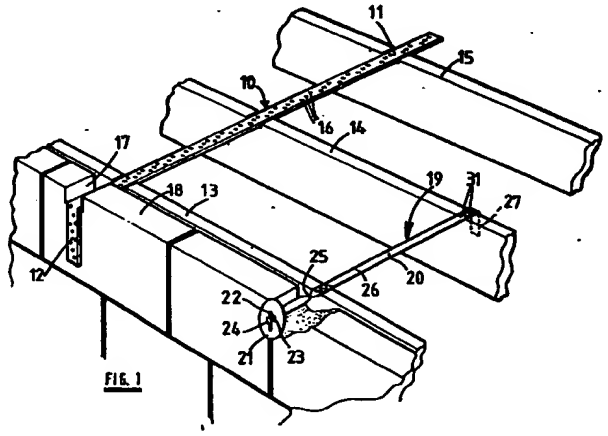

FIG. 1

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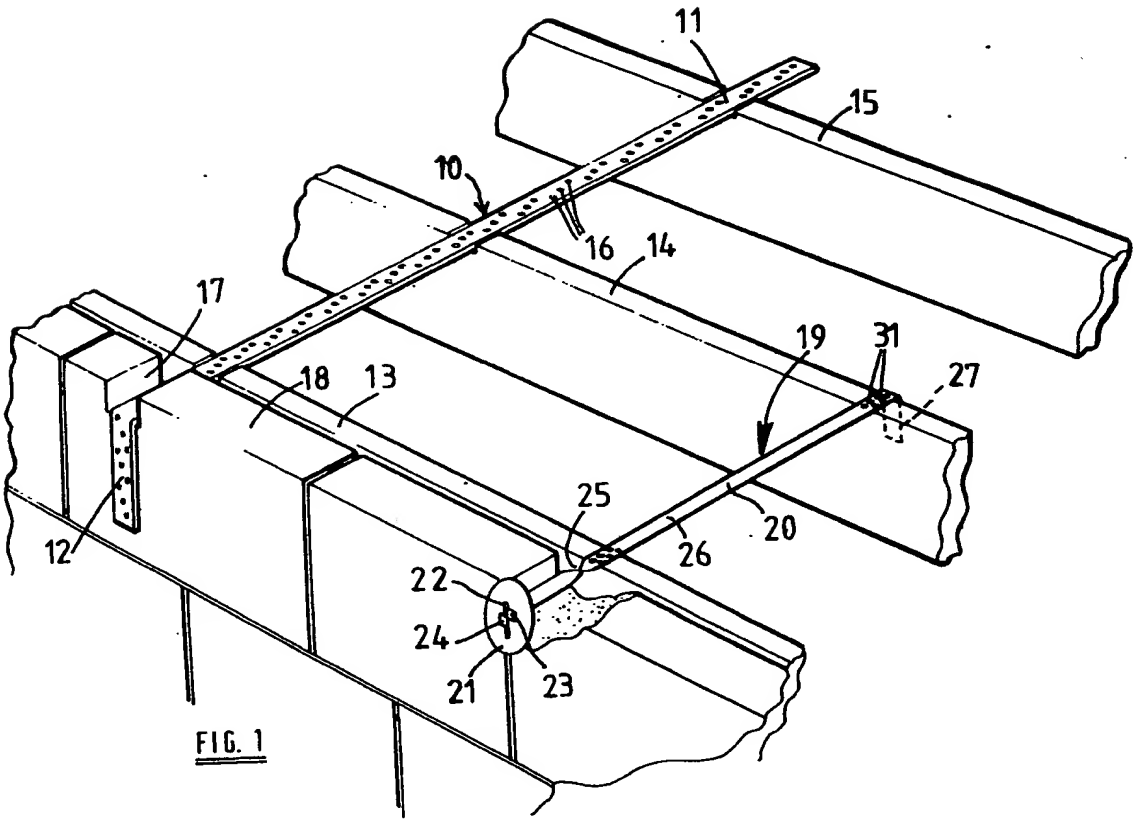
11
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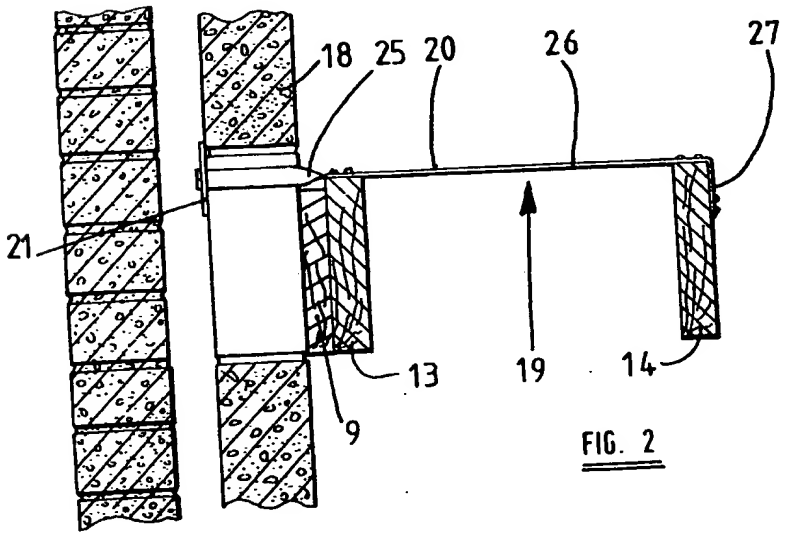
FIG. 1


18
25
20
26
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21
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19
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9

FIG. 2

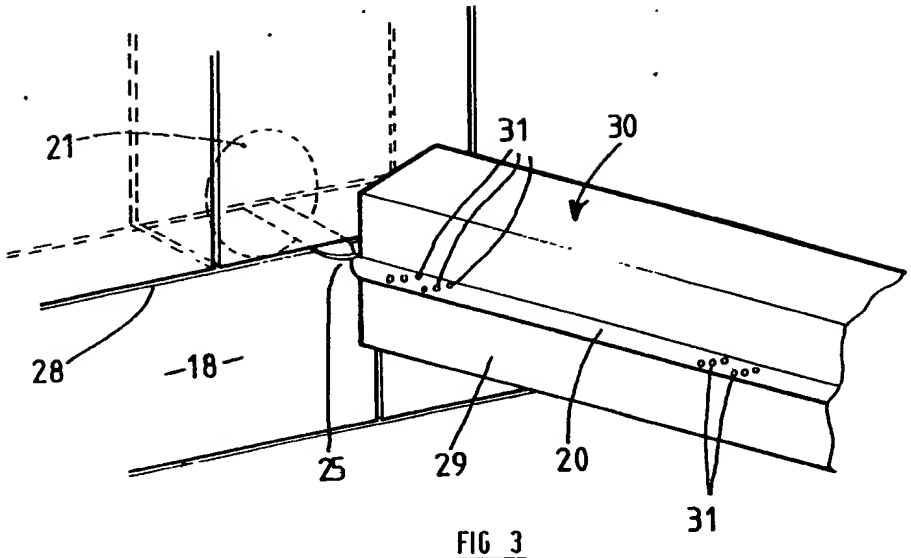

FIG 3

SPECIFICATION

Lateral restraint strap for building construction and methods of providing lateral restraint to a building structure

This invention relates to restraint straps for building construction and to methods of providing lateral restraint to a building structure.

When the walls of a building are subjected to high winds, side loads are caused which could in severe cases exceed the strength of the wall and cause collapse. To prevent such collapse, the practice has arisen of adding restraining straps of metal to the building during construction so as to link together the upright walls and the horizontal "diaphragms" afforded by the floor and/or ceiling platforms. Internal walls are also sometimes linked to the horizontal diaphragms to provide restraint. Such straps are called "lateral restraint straps".

Other straps may be used vertically to secure the roof structure to the walls of the building but the present invention is concerned primarily with lateral restraint straps.

When the Building Regulations covering the use of lateral restraint straps were first introduced, certain specific requirements were applied to such straps, which governed for example their size and shape, and the material of which they were made. These requirements were later modified so that the present Building Regulations require only that the strength of lateral restraint straps should be sufficient to meet the design requirements.

Conventional lateral restraint straps are of 30mm. wide, 5mm. thick mild steel and are supplied pre-bent to an L-shape having a short limb of approximately 150mm. in length and a long limb of between 650mm. and 1450mm. in length, depending on the intended use.

For lateral restraint, the short limb abuts the inner leaf masonry in the cavity of a cavity wall and the long limb, after passing in a horizontal plane through the masonry, is nailed to the joists.

Where the joists are parallel to the wall, the long limb lies in a horizontal plane, the tops of the joists are notched to receive it and it is nailed in place to at least three joists.

Where the joists are perpendicular to the wall, the strap is supplied with a pre-formed 90° twist so that, after it has passed through the wall in a horizontal plane, it twists to a vertical plane. It then lies along an upright side face of a joist to which it is nailed.

This conventional strap has certain disadvantages which the present invention seeks to overcome.

Firstly, it requires a considerable amount of steel, which is used relatively ineffectively. The strength of the conventional strap is considerably greater than the design requirement. It is secured to the joists only by nailing and hence needs to be long enough to span at least three joists to give adequate fixing. Its thickness means that the tops of joists which it crosses must be notched so that it does not stand proud of the joists.

Secondly, the rigidity of the conventional strap means that it must be pre-bent to shape and hence the correct number of plain and twisted L-shaped straps needs to be estimated before ordering. Bending on site is not possible. No adjustment can be made for tolerances met in the building itself.

Thirdly, with the increasing use of relatively soft lightweight blocks for building the inner leaf of a cavity wall, the bearing area abutting the masonry (typically 150mm. x 30mm.) may be insufficient to take the imposed load on the strap without causing crumbling of the blockwork. In particular, the loading is concentrated at the top edge of the block which is abutted by the bend of the conventional lateral restraint strap.

Finally, the need to place the strap in a horizontal plane in the masonry may mean that, where large blocks are used, these need to be channelled to allow the strap to be inserted at the correct level to suit the joists.

It is an object of the invention to overcome or reduce some or all of these disadvantages.

According to a first aspect of the invention, there is provided a lateral restraint strap comprising, in combination, an elongate strip and a bearing member adapted to be mounted on the elongate strip and to be located at a first end portion thereof.

The elongate strip may have location means at said first end portion to locate the bearing member. For example, the strip may be split lengthwise at said first end portion and the split parts may be bent in opposite senses to locate the bearing member.

The elongate strip may have a 90° twist pre-formed in the strip at a position near said first end portion, whereby, in use, the bearing member may abut one face of a wall and the twist may lie adjacent the other face of the wall, through which the strip passes.

Since the exact position of the bearing member along the strip is determined on site, small variations in wall thickness can readily be accommodated.

The bearing member may comprise a rigid laminar member. The laminar bearing member may have a slot adapted to receive the strip as a sliding fit. The slot may be wholly enclosed by the material of the laminar bearing member.

The invention also provides a method of providing lateral restraint to a building structure comprising an upright wall and a plurality of joists lying generally parallel to the wall, the method comprising:

taking a lateral restraint strap according to the first aspect of the invention set out above;

disposing the lateral restraint strap with its bearing member abutting the face of the wall remote from the joists and with the elongate strip firstly passing through an upright joint between masonry elements of the wall and then twisting to lie in a generally horizontal plane on a plurality of joists;

nailing the strip to the joists on which it lies;

and bending the end of the strip remote from the wall downwardly into abutment with an upright face of the furthermost of said plurality of joists onto which the strip is nailed.

The strip may be hammered to indent it into the joists to which it is nailed, to afford a substantially flush surface.

Preferably, the strip overlies two joists only.

The invention also provides a method of providing lateral restraint to a building structure comprising an upright wall and a joist lying generally perpendicular

to the wall, the method comprising:

taking a lateral restraint strap according to the first aspect of the invention set out above;

disposing the restraint strap with its bearing member abutting the face of the wall remote from said joist and with the elongate strip firstly passing through a generally horizontal coursing joint between superimposed courses of masonry elements of the wall and then twisting to lie in a generally upright plane along a generally upright face of said joist;

and nailing the strip to said upright face of the joist.

Lateral restraint straps embodying the invention will now be described in more detail, by way of example only, with reference to the accompanying drawings, in which:—

FIGURE 1 is a perspective view of part of a building structure showing, by way of comparison, the use of both a conventional lateral restraint strap and a lateral restraint strap embodying the invention in a building structure including joists parallel to a wall;

FIGURE 2 is a side elevational view of a lateral restraint strap embodying the invention in use in a building structure including joists parallel to a wall;

FIGURE 3 is a perspective view of part of a building structure in which a joist lies perpendicular to a wall, showing a lateral restraint strap embodying the invention in use.

Referring firstly to Figure 1, a conventional type of lateral restraint strap is shown at 10 and comprises a rigid mild steel element of L-shape, having a long limb 11 and a short limb 12 at right angles to the long limb. The short limb 12 is about 150mm. long, while the length of the long limb 11 is selected according to the likely loading, and is equivalent to at least the span across three parallel joists. The conventional strap is provided with groups of nail holes along its entire length. It has a thickness of about 5mm.

The conventional strap 10 is secured to three joists, 13, 14, 15 by nailing through the nail holes 16 provided throughout its length. Since its effectiveness as a restraint depends on the security of this connection to the joists and since only the nails provide the connection, it is necessary to fix to three joists. This determines the minimum length of the strap 10.

At the wall, the strap 10 is shown channelled into the blockwork 18 forming the inner leaf at 17, because the top of the large blocks does not coincide with the level of the joists 13, 14, 15. This channelling is undesirable because it weakens the block.

Where the blockwork is of soft, lightweight thermal insulation blocks, there is a risk of crumbling when a load is applied to the strap, even if the block is not channelled, because of the relatively small bearing area of the short limb 12, and also because all the load is transmitted only to one block of the inner leaf 18.

Figure 1 also shows a lateral restraint strap of a type embodying the invention, indicated at 19. The strap 19 is in two parts, which are assembled together on site. The first part is a strip of a material capable of carrying a substantial tensile load, for example a metal or suitable plastics material. In the example shown, the strip 20 is of stainless steel. Another suitable material would be polypropylene. The second part of the lateral restraint strap 19 is a laminar bearing member in the form of a disc 21 which abuts against the masonry of the inner leaf 18 of the cavity wall. The disc 21 has a slot 22 in its centre, which can receive the strip 20 as a sliding fit. Some form of location means is provided at the end of the strip 20, to retain the disc 21 when it has been assembled to the strip. For example, when the strip is of metal such as stainless steel, a split may be made lengthwise in its end and the split portions 23 and 24 turned in opposite directions to form location means. Where the strip 20 is of polypropylene, location means are moulded on in manufacture.

The strip 20 has a 90° twist 25 formed in it, near the end having the location means. The twist is so positioned that it lies adjacent the masonry of the inner leaf 18 on the side opposite to the disc 21, but within the thickness normally allowed for finishing the inner face of the wall with plaster, skirting boards and so on.

In a conventional strap, the relatively large cross-section has made it impossible to accomodate a twist in the strap within the normal finishing thickness. Only when used below floor level with the joists perpendicular to the wall can such a strap be provided with a twist. By reducing the cross-section of the strip 20 to match the design load more closely, the advantages of using a twisted strap can also be achieved in structures such as that shown in Figure 2.

It has been found that a strip of sufficient strength can be made in stainless steel with a thickness of only 2mm. and a width of 16mm. The small thickness means that the joists need not be notched to receive the strip 20 which is merely hammered into the top surface to lie flush with the joists. Reference to Figure 1 will show that the conventional strap, having a thickness of about 5mm., has had to be sunk into notches in the joists to prevent it from lying proud of the joists. This notching weakens the joists and takes up extra time, particularly as several joists have to be notched for each strap.

The strap 19 is positioned so that the disc 21 lies in abutment with the inner leaf of the wall 18. The strip 20 is disposed upright in a joint between adjacent masonry elements of the inner leaf 18. The twist lies adjacent the inner face of the wall, the remainder 26 of the strip 20 then lying in a generally horizontal plane on top of the joists 13, 14. The strip is nailed to these joists.

The restraint strap is secured to two joists only. Extra resistance to imposed loads is given by bending down the inner free end portion 27 of the strip against the face of the joist 14 facing away from the wall. Where the strip is of metal, the relative thinness of the strip allows it to be bent on site using a hammer. Tolerances in building construction have made it impossible to prebend the conventional strap, which has therefore had to be held in place only by nailing and hence has needed to span three joists at least. A spacer block 9 between the inner leaf masonry 18 and the joist 13 provides support against wind loading tending to push the wall inwardly towards the joists.

The strip can be nailed at 27 to the side face of the joist 14 if desired. Where it is made of a plastics material, the strip must be nailed to the side face.

The lateral restraint strap 19 may be supplied with the twist 25 pre-formed and with the split portions 23 and 24 lying in the plane of the strip. The disc will be

supplied separately for easy transport to the site. On site, the split end portions 23 and 24 will be separated and the disc 21 slid onto the strip 20 from the other end. The slot 22 is of sufficient size to slide freely on the strip 20 and past the twist 25 up to the location means.

A method of using the lateral restraint strap 19 in a building construction where the joists lie parallel to the wall has already been described. In applications where the joists lie perpendicular to the wall, a slightly different method is used.

Referring to Figure 3, the inner leaf 18 of a cavity wall is shown as being made of courses of large blocks. The lateral restraint strap 19 is disposed so that the disc 21 lies against the outer face of the leaf 18 of the wall, as before, but the portion of the strip 20 between the disc 21 and the twist 25 is passed in a horizontal plane through the coursing joint between adjacent superimposed courses of blockwork, and not vertically as before. At least one coursing joint is likely to occur within the depth of a joist 30.

The strip is positioned along the side face 29 of the joist 30 and nailed in place using the groups of holes 31. It will be appreciated that the end of the strip is allowed to remain straight along the face 29 of the joist.

In either mode of using the strap 19, it will be seen that no cutting of either joists or masonry is necessary. The large bearing area of the disc 21 spreads the loading imposed on the masonry. Furthermore, in either mode of use, the disc always bears against at least two, and sometimes more than two of the masonry elements of the wall, giving added security.

It will be appreciated that the strap uses a reduced amount of material, compared with a conventional strap, when made in metal, partly because its fixing is more secure than hitherto and enables its length to be reduced to span only two instead of three joists. The thinner section and narrower width of the strip 20 also give rise to economy in material.

Time and labour costs may also be reduced because the new lateral restraint strap 19 does not require channelling of either blockwork or joists for fitment in a building structure.

CLAIMS

1. A lateral restraint strap comprising, in combination, an elongate strip and a bearing member adapted to be mounted on the elongate strip and to be located at a first end portion thereof.

2. A lateral restraint strap according to claim 1 wherein the elongate strip has location means at said first end portion to locate the bearing member.

3. A lateral restraint strap according to claim 2 wherein the strip is split lengthwise at said first end portion and the split parts are bent in opposite senses to locate the bearing member.

4. A lateral restraint strap according to any preceding claim wherein the elongate strip has a 90° twist pre-formed in the strip at a position near said first end portion whereby, in use, the bearing member may abut one face of a wall and the twist may lie adjacent the other face of the wall through which the strip passes.

5. A lateral restraint strap according to any preceding claim wherein the bearing member comprises a rigid laminar member.

6. A lateral restraint strap according to claim 5 wherein the laminar bearing member has a slot adapted to receive the strip as a sliding fit.

7. A lateral restraint strap according to claim 6 wherein the slot is wholly enclosed by the material of the laminar bearing member.

8. A method of providing lateral restraint to a building structure comprising an upright wall and a plurality of joists lying generally parallel to the wall, the method comprising:

taking a lateral restraint strap according to any one of claims 4 to 7;

disposing the lateral restraint strap with its bearing member abutting the face of the wall remote from the joists and with the elongate strip firstly passing through an upright joint between masonry elements of the wall and then twisting to lie in a generally horizontal plane on a plurality of joists;

nailing the strip to the joists on which it lies;

and bending the end of the strip remote from the wall downwardly into abutment with an upright face of the furthermost of said plurality of joists onto which the strip is nailed.

9. A method according to claim 8 wherein the strip is hammered to indent it into the joists to which it is nailed, to afford a substantially flush surface.

10. A method according to claim 8 or claim 9 wherein the strip overlies two joists only.

11. A method of providing lateral restraint to a building structure comprising an upright wall and a joist lying generally perpendicular to the wall, the method comprising:

taking a lateral restraint strap according to any one of claims 4 to 7

disposing the restraint strap with its bearing member abutting the face of the wall remote from said joist and with the elongate strip firstly passing through a generally horizontal coursing joint between superimposed courses of masonry elements of the wall and then twisting to lie in a generally upright plane along a generally upright face of said joist;

and nailing the strip to said upright face of the joist.

12. A novel lateral restraint strap substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

13. A method of providing lateral restraint to a building structure according to claim 8 and substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings.

14. A method of providing lateral restraint to a building structure according to claim 11 and substantially as hereinbefore described with reference to and as illustrated in Figure 3 of the accompanying drawings.

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